RackSwitch G7028
Lenovo Press Product Guide

The RackSwitch™ G7028 is an inexpensive entry level Layer 2 1/10 Gb Ethernet switch that is designed for the data center. Data center customers continue to deploy applications using 1 GbE networking switches while 10 GbE continues to grow for customer solutions requiring greater I/O bandwidth. The RackSwitch G7028 is an ideal solution for data center customers looking for an economical 1 Gb and 10 Gb connectivity solution.

The RackSwitch G7028 (Figure 1) is a top-of-rack data center switch that delivers excellent non-blocking, wire speed performance at an attractive price point. It supports twenty-four 10/100/1000BASE-T RJ45 ports and four 10 Gigabit Ethernet SFP+ ports standard, while typically using only 45 watts of power. The RackSwitch G7028 is also designed with rear-to-front airflow, which allows for flexible mounting of the switch in a rack cabinet and provides convenient cable management and significant savings in cooling costs.

Figure 1. RackSwitch G7028

Did you know?

The RackSwitch G7028 is designed with non-blocking, line-rate throughput.

The RackSwitch G7028 supports an optional external redundant power supply with the G7000 Redundant Power Supply option.

The RackSwitch G7028 is designed specifically for the data center environment with server-matching airflow, cost-effective Layer 2 switching, and ease of configuration management.

Networking Operating System software features deliver seamless, standards-based integration into existing upstream switches.

Part number information

The part numbers to order the switch and additional options are shown in Table 1.

Table 1. Part numbers and feature codes for ordering

Description	Part number	Feature code for MTM 7309-HCP
Switch		
RackSwitch G7028	7309BAX	A4BW
Redundant power supply and DC cables		
RackSwitch G7000 Redundant Power Supply	00AY123	A4BZ
RackSwitch G7000 1.8m DC to DC RPS Power Cable	00AY121	A4C0
Miscellaneous options		
Console Cable Kit Spare	90Y9462	A2MG
Adjustable 19" 4 Post Rail Kit	00D6185	A3KP
Air Inlet Duct for 382 mm RackSwitch	00D6062	A3HG

The part number for the G7028 switch, 7309BAX, includes the following items:

● One RackSwitch G7028 (rear-to-front airflow)
● Generic Rack Mount Kit (2-post)
● Power Cord Retention Clip
● RJ-45 to DB-9 serial cable (1.8 m)
● Warranty Flyer
● Important Notices Flyer
● Documentation CD-ROM

Note: Power cables are not included and must be ordered separately (see Table 2 for details).

The switch comes standard with the 1.8 m RJ-45 to DB-9 serial management cable. Additional 1.8 m RJ-45 to DB-9 serial management cables can be ordered as a part of Console Cable Kit, part number 90Y9462, if required.

The Console cable Kit contains three cables:

● RJ-45 to RJ-45
● Mini-USB to RJ-45
● DB-9 to RJ-45

Lenovo offers the RackSwitch G7000 Redundant Power Supply for those customers requiring redundant power; it can support up to four RackSwitch G7028 or G7052 switches. The G7000 Redundant Power Supply is shown in Figure 2.

Figure 2. RackSwitch G7000 Redundant Power Supply

The part number for the G7000 Redundant Power Supply, 00AY123, includes the following items:

- One RackSwitch G7000 Redundant Power Supply (rear-to-front airflow)
- Two 1.8 m DC to DC power cables
- Generic Rack Mount Kit (2-post)
- Power Cord Retention Kit
- Warranty Flyer
- Important Notices Flyer
- Documentation CD-ROM

The G7000 RPS option comes standard with two 1.8 m DC to DC power cables. Additional DC to DC power cables (part number 00AY121; each part number contains one cable) can be ordered if needed.

Both the G7028 switch and G7000 RPS option support optional adjustable 19-inch, 4-post rack installation kit, part number 00D6185. Optionally, Air Inlet Duct, part number 00D6062, can be ordered with the G7028 switch or G7000 RPS option for 4-post rack installations.

The G7028 switch and G7000 RPS option ship standard without any AC power cables. Table 2 lists the part numbers and feature codes to order the power cables.

Table 2. Power cables

Description	Part number	Feature code for MTM 7309-HCP
Rack power cables		
12ft Power Cable C13-C14	39Y7932	6263
1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	39Y7937	6201
IEC309 C20 to C13 rack jumper cable	39Y7938	6204
Country-specific power cords		
European 10A line C13 to CEE 7/7 (2.8M)	39Y7917	6212
Denmark 10A line C13 to DK2-5A (2.8M)	39Y7918	6213
Switzerland 10A line C13 to SEV 1011 (2.8M)	39Y7919	6216
Israel 10A line C13 to SI 32 (2.8M)	39Y7920	6218
Italy 10A line C13 to CEE 7/7 (2.8M)	39Y7921	6217
South Africa 10A line C13 to SABS 164/1 (2.8M)	39Y7922	6214
United Kingdom 10A line C13 to BS 1363 (2.8M)	39Y7923	6215
Australia/NZ 10A line C13 to SAA-AS C112 (2.8M)	39Y7924	6211
Korea 7A line C13 to KETI 15A/250V (2.8M)	39Y7925	6219
India 6A line C13 to Fig 68 (2.8M)	39Y7927	6269
China 6A line C13 to GB 2099.1 (2.8M)	39Y7928	6210
Brazil 10A line C13 to NBR 6147 (2.8M)	39Y7929	6223
Argentina 10A line C13 to IRAM 2063 (2.8M)	39Y7930	6222
Power Cable - C13 / NEMA 5-15P 14ft	39Y7931	6207
Power Cord Taiwan AC plug 10A/250V, 2.8M; OPT	00CG265	A53E
Power Cord Taiwan AC plug 15A/125V; 2.8M; OPT	00CG267	A53F
10A/250V C13 to NEMA 6-15P 2.8m power cord	46M2592	A1RF
Japan 10A/100V C13 to JIS C-8303 2.8m power cord	46M2593	A1RE

Supported cables and transceivers

With the flexibility of the G7028 switch, clients can take advantage of the technologies that they require for multiple environments:

- For 1 GbE links, you can use RJ-45 UTP cables up to 100 m. Clients that need longer distances can leverage the SFP/SFP+ ports by using a 1000BASE-SX transceiver, which can drive distances up to 220 meters by using 62.5 µ multi-mode fiber and up to 550 meters with 50 µ multi-mode fiber or the 1000BASE-LX transceivers that support distances up to 10 kilometers using single-mode fiber (1310 nm).

- For 10 GbE (supported on SFP+ ports), clients can use direct-attached copper (DAC) SFP+ cables for in-rack cabling for distances up to 7 m. These DAC cables have SFP+ connectors on each end, and they do not need separate transceivers. For longer distances, the 10GBASE-SR transceiver can support distances up to 300 meters over OM3 multimode fiber or up to 400 meters over OM4 multimode fiber with LC connectors. The 10GBASE-LR transceivers can support distances up to 10 kilometers on single mode fiber with LC connectors.

Table 3 lists the supported SFP/SFP+ and DAC cable options.

Table 3. Supported SFP/SFP+ transceivers and DAC cables

Description	Part number	Feature code for MTM 7309-HCP
SFP transceivers - 1 GbE		
SFP 1000Base-T (RJ-45) Transceiver (does not support 10/100 Mbps)	00FE333	A5DL
SFP SX Transceiver	81Y1622	3269
SFP LX Transceiver	90Y9424	A1PN
SFP+ transceivers - 10 GbE		
SFP+ SR Transceiver	46C3447	5053
SFP+ LR Transceiver	90Y9412	A1PM
SFP+ passive direct-attach cables - 10 GbE		
.5m Passive DAC SFP+ Cable	00D6288	A3RG
1m Passive DAC SFP+ Cable	90Y9427	A1PH
1.5m Passive DAC SFP+ Cable	00AY764	A51N
2m Passive DAC SFP+ Cable	00AY765	A51P
3m Passive DAC SFP+ Cable	90Y9430	A1PJ
5m Passive DAC SFP+ Cable	90Y9433	A1PK
7m Passive DAC SFP+ Cable	00D6151	A3RH
SFP+ active direct-attach cables - 10 GbE		
1m Active DAC SFP+ Cable	95Y0323	A25A
3m Active DAC SFP+ Cable	95Y0326	A25B
5m Active DAC SFP+ Cable	95Y0329	A25C

Benefits

The RackSwitch G7028 switch is considered particularly suited for these clients:

- Clients who want to leverage GbE in their infrastructure (both servers and networking)
- Clients who are implementing a virtualized environment and require multiple GbE ports
- Clients who require investment protection for 10 GbE ports
- Clients who want to reduce TCO and improve performance while maintaining high levels of availability and security
- Clients who want to avoid or minimize oversubscription, which can result in congestion and loss of performance
- Clients who want to implement a converged infrastructure with NAS or iSCSI

The switch offers the following key benefits:

- Increases network performance

  The RackSwitch G7028 provides up to 128 Gbps of switching throughput, supports four SFP+ 10 Gb uplink ports for zero oversubscription, and has a port to port latency of 3.3 microseconds.

- Lower power and exceptional cooling

  The RackSwitch G7028 typically consumes just 45 W of power. Unlike side-cooled switches, which can cause heat recirculation and reliability concerns, the RackSwitch G7028 switch's rear-to-front cooling design reduces data center air conditioning costs by matching airflow to the server's configuration in the rack.

- Fault tolerance

  These switches learn alternative paths automatically and perform faster convergence if there is a link, switch, or power failure. The switch uses technologies such as Virtual Link Aggregation, L2 trunk failover, and HotLinks.

- Seamless interoperability

  RackSwitch switches interoperate seamlessly with other vendors' upstream switches.

Features and specifications

The G7028 switch has the following features and specifications:

- Form factor: 1U rack mount switch
- Ports
  - Twenty-four 10/100/1000 Mb Ethernet ports with RJ-45 connectors
  - Four ports for 1 Gb or 10 Gb Ethernet SFP/SFP+ transceivers (support for 1000BASE-SX, 1000BASE-LX, 1000BASE-T, 10GBASE-SR, or 10GBASE-LR) or SFP+ direct-attach copper (DAC) cables. SFP/SFP+ modules or DAC cables are not included and must be purchased separately.
  - One Ethernet port (RJ-45 connector) for out of band (OOB) management
  - One RS-232 serial port (RJ-45 connector) that provides an additional means to configure the switch module
  - One USB port for mass storage devices

- Scalability and performance
  - 10 Gb Ethernet ports for maximum network bandwidth
  - Autosensing 10/1000/1000 Gigabit Ethernet ports for bandwidth optimization
  - Non-blocking architecture with wire-speed forwarding of traffic; up to 128 Gbps of full duplex switching throughput
  - Up to 96 Million packets per second (Mpps) with switching latency of 3.3 microseconds
  - Media access control (MAC) address learning: Automatic update, support of up to 8,000 MAC addresses
  - Static and LACP (IEEE 802.3ad) link aggregation
  - Support for jumbo frames (up to 12,288 bytes)
  - Broadcast/multicast storm control
  - IGMP snooping for limit flooding of IP multicast traffic
  - IGMP filtering to control multicast traffic for hosts participating in multicast groups
  - Configurable traffic distribution schemes over trunk links based on source/destination IP or MAC addresses or both
  - Fast port forwarding for rapid STP convergence
- Availability and redundancy
  - IEEE 802.1D STP for providing L2 redundancy
  - IEEE 802.1s Multiple STP (MSTP) for topology optimization, up to 32 STP instances are supported by single switch
  - IEEE 802.1w Rapid STP (RSTP) (provides rapid STP convergence for critical delay-sensitive traffic such as voice or video)
  - Per-VLAN Rapid STP (PVRST) enhancements
  - Layer 2 Trunk Failover to support active/standby configurations of network adapter teaming on compute nodes
  - Hot Links provides basic link redundancy with fast recovery for network topologies that require Spanning Tree to be turned off
- VLAN support
  - Port-based and protocol-based VLANs
  - Up to 4095 VLANs supported per switch (512 active VLANs), with VLAN numbers 1 - 4095 (4095 is used for management connection only)
  - 802.1Q VLAN tagging support on all ports
  - 802.1x with Dynamic VLAN assignment
  - Private VLANs
- Virtualization
  - Virtual Link Aggregation support

- Security
  - VLAN-based, MAC-based, and IP-based access control lists (ACLs)
  - 802.1x port-based authentication
  - Multiple user IDs and passwords
  - User access control
  - Radius, TACACS+ and LDAP authentication and authorization
- Quality of Service (QoS)
  - Support for IEEE 802.1p, IP ToS/DSCP, and ACL-based (MAC/IP source and destination addresses, VLANs) traffic classification and processing
  - Traffic shaping and re-marking based on defined policies
  - Eight priority queues per port for processing qualified traffic
  - Weighted random early detection with explicit congestion notification (WRED/ECN)
  - CPU priority policies (CoPP)
  - IPv4/IPv6 ACL metering
- IP v4 Layer 3 functions
  - Host management
  - IP filtering with ACLs
  - Support for DHCP client
  - Support for IGMP snooping and IGMP relay
- IP v6 Layer 3 functions
  - IPv6 host management
  - IPv6 filtering with ACLs
- Manageability
  - Industry-standard CLI (isCLI)
  - Simple Network Management Protocol (SNMP V1 and V3)
  - HTTP/HTTPS browser GUI
  - Telnet interface for CLI
  - SSH and SSH v2
  - Secure Copy (SCP)
  - Serial interface for CLI
  - Firmware image update (TFTP and FTP)
- Monitoring
  - Switch LEDs for port status and switch module status indication
  - Remote Monitoring (RMON) agent to collect statistics and proactively monitor switch performance
  - Port mirroring for analyzing network traffic passing through the switch
  - Change tracking and remote logging with the syslog feature

The G7000 RPS option has the following features and specifications:

- Form factor: 1U rack mount
- Power connections: Four DC connections in the rear of the rack to connect to the RackSwitch G7028 and G7052 switch; one AC inlet connector to connect to the power source (rack PDU or wall connector)
- Airflow: Rear-to-front cooling
- Power: Approximately 244 W, which varies depending upon operating conditions
- Rack installation: Generic rack-mount kit (2-post); optional flexible 4-post mounting option for both the server rack and the communications rack
- LEDs: System LEDs to indicate status

Standards supported

The G7028 switch supports the following IEEE standards:

- IEEE 802.1D Spanning Tree Protocol (STP)
- IEEE 802.1s Multiple STP (MSTP)
- IEEE 802.1w Rapid STP (RSTP)
- IEEE 802.1p Class of Service (CoS) prioritization
- IEEE 802.1Q Tagged VLAN (frame tagging on all ports when VLANs are enabled)
- IEEE 802.1x port-based authentication
- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet
- IEEE 802.3ab 1000BASE-T copper twisted-pair Gigabit Ethernet
- IEEE 802.3z 1000BASE-SX short range fiber optics Gigabit Ethernet
- IEEE 802.3z 1000BASE-LX long range fiber optics Gigabit Ethernet
- IEEE 802.3ad Link Aggregation Control Protocol
- IEEE 802.3x Full-duplex Flow Control
- IEEE 802.3ae 10GBASE-SR short range fiber optics 10 Gb Ethernet
- IEEE 802.3ae 10GBASE-LR long range fiber optics 10 Gb Ethernet
- 10GSFP+Cu SFP+ Direct Attach copper

Connectors and LEDs

Figure 3 shows the front panel of the RackSwitch G7028.
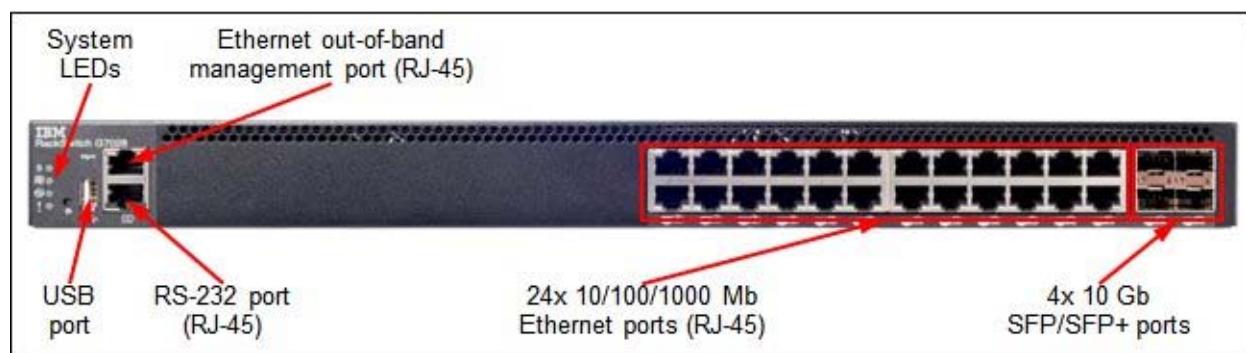
Figure 3. Front panel of the RackSwitch G7028

The front panel of the G7028 contains the following components:

- LEDs that display the status of the switch module and the network.
- One RJ-45 RS-232 console port that provides an additional means to configure the switch module.
- Twenty-four 1000BASE-T Ethernet ports for 10/100/1000 Mbps connections.
- Four SFP+ port connectors to attach SFP/SFP+ transceivers for 1 Gb or 10 Gb connections or DAC cables.
- An Ethernet link OK LED and an Ethernet Tx/Rx LED for each Ethernet port on the switch.

Figure 4 shows the rear panel of the RackSwitch G7028.
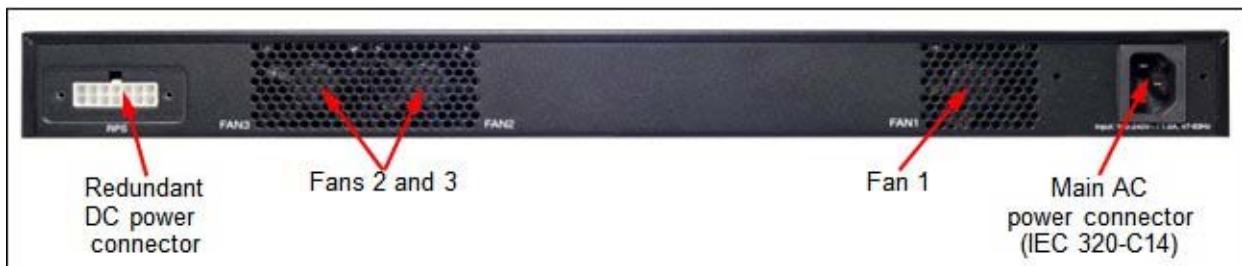
Figure 4. Rear panel of the RackSwitch G7028

The rear panel of the G7028 contains the following components:

- One AC power connector (IEC 320-C14)
- Three fans
- One DC power connector for power supply redundancy

Figure 5 shows the rear panel of the RackSwitch G7000 RPS option.

Figure 5. Rear panel of the RackSwitch G7000 RPS option

The rear panel of the G7000 RPS option contains the following components:

- One AC power connector (IEC-320 C14)
- Four DC power connectors

Network cabling requirements

The network cables that can be used with the switch are listed in Table 4.

Table 4. G7028 network cabling requirements

Transceiver	Standard	Cable	Connector
10 Gb Ethernet			
SFP+ SR Transceiver (46C3447)	10GBASE-SR	850 nm OM3 multimode fiber cable (50 μ or 62.5 μ) up to 300 m or up to 400 m with OM4 multimode fiber	LC
SFP+ LR Transceiver (90Y9412)	10GBASE-LR	1310 nm single-mode fiber cable up to 10 km	LC
Direct attach cable	10GSFP+Cu	SFP+ DAC cables up to 7 m (see Table 3)	SFP+
1 Gb Ethernet			
RJ-45 ports (fixed)	1000BASE-T	UTP Category 5, 5E, and 6 up to 100 meters	RJ-45
SFP RJ-45 Transceiver (00FE333)	1000BASE-T	UTP Category 5, 5E, and 6 up to 100 meters	RJ-45
SFP SX Transceiver (81Y1622)	1000BASE-SX	850 nm multimode fiber cable (50 μ or 62.5 μ) up to 550 m	LC
SFP LX Transceiver (90Y9424)	1000BASE-LX	1310 nm single-mode fiber cable up to 10 km	LC
Management ports			
Ethernet management port	1000BASE-T	UTP Category 5, 5E, and 6 up to 100 meters	RJ-45
RS-232 serial console port	RS-232	DB-9-to-RJ-45 (comes standard with the G7028 switch)	RJ-45

Warranty

The RackSwitch G7028 comes with a limited 3-year hardware warranty with Next Business Day (NBD), 9x5, Customer Replaceable Unit (CRU) warranty service and includes a 3-year software license, providing entitlement to upgrades over that period. Optional warranty and maintenance upgrades are available for the G7028 through IBM ServicePac®:

● Warranty service upgrades (3, 4, or 5 years)

    o 24x7 onsite repair with 4-hour target response time
    o 24x7 onsite repair with same day target response time
    o 9x5 onsite repair with 4-hour target response time

● Maintenance (post-warranty) service offerings (1 or 2 years)

    o 9x5 onsite repair with 4-hour target response time
    o 9x5 onsite repair with next business day target response time

ServicePac offerings are country-specific, that is, each country might have its own service types, service levels, response times, and terms and conditions. Not all covered types of ServicePac offerings might be available in a particular country.

For more information about the ServicePac offerings that are available in your country, visit the IBM ServicePac Product Selector at the following website: https://www-304.ibm.com/sales/gss/download/spst/servicepac

The RackSwitch G7000 RPS option comes with a limited 1-year hardware warranty with Next NBD, 9x5, CRU warranty service.

Physical specifications

The approximate dimensions and weight of the G7028 switch are as follows:

- Height: 44 mm (1.7 in.)
- Width: 440 mm (17.3 in.)
- Depth: 382 mm (15.0 in.)
- Weight: 5.3 kg (11.7 lb)

The approximate dimensions and weight of the G7000 RPS option are as follows:

- Height: 44 mm (1.7 in.)
- Width: 440 mm (17.3 in.)
- Depth: 382 mm (15.0 in.)
- Weight: 5.4 kg (11.9 lb)

Operating environment

The G7028 switch is supported in the following operating environment:

- Temperature: 0 to 40 ºC.
- Relative humidity: Non-condensing, 10 - 90%
- Altitude: 1,800 m (6,000 feet)
- Acoustic noise: Less than 65 dB
- Typical power: 45 W

The G7000 RPS option is supported in the following operating environment:

- Temperature: 0 to 40 ºC.
- Relative humidity: Non-condensing, 10 - 90%
- Altitude: 1,800 m (6,000 feet)
- Acoustic noise: Less than 65 dB
- Typical power: 245 W

Typical configurations

This section describes popular configurations of the RackSwitch G7028.

Rack-optimized server aggregation of 1 GbE attached rack servers

Some of the typical deployments for the RackSwitch G7028 include Data Center Top of Rack, Low-Cost L2 connection, and remote offices for various workloads, such as email, file and print services, collaborative, web serving, and cloud.

Here are examples of possible high-concentration configurations for rack or blade server implementations:

- System x® and ThinkServer® 1U or 2U servers with a 1 GbE adapter installed
- System x 4U servers with multiple 1 GbE adapters per server
- BladeCenter® or Flex System® using any of the following modules in the chassis:
  - BladeCenter Layer 2/3 Copper and Fiber Gigabit Ethernet Switch Modules
  - BladeCenter Layer 2-7 Gigabit Ethernet Switch Module
  - BladeCenter 1/10 Gb Uplink Ethernet Switch Module
  - Intelligent Copper Pass-Thru Module for BladeCenter
  - Server Connectivity Module for BladeCenter
  - Flex System using EN2092 Ethernet modules in the chassis

Table 5 lists the features and benefits of the RackSwitch G7028 for server aggregation.

Table 5. Features and benefits of the RackSwitch G7028 for server aggregation

Features	Benefits
Line-rate, non-blocking, all 24 ports	Supports compute and virtualization workloads
3.3 microseconds latency	Fast application response times
Four 10 GbE uplink ports (40 Gb bandwidth to the core or upstream switch)	No oversubscription, full upstream throughput
Standards-based Layer 2 protocols, industry standard CLI	Interoperates with existing network with no learning curve

Figure 6 shows rack-optimized server aggregation for 1 GbE attached rack servers or a Flex System chassis.
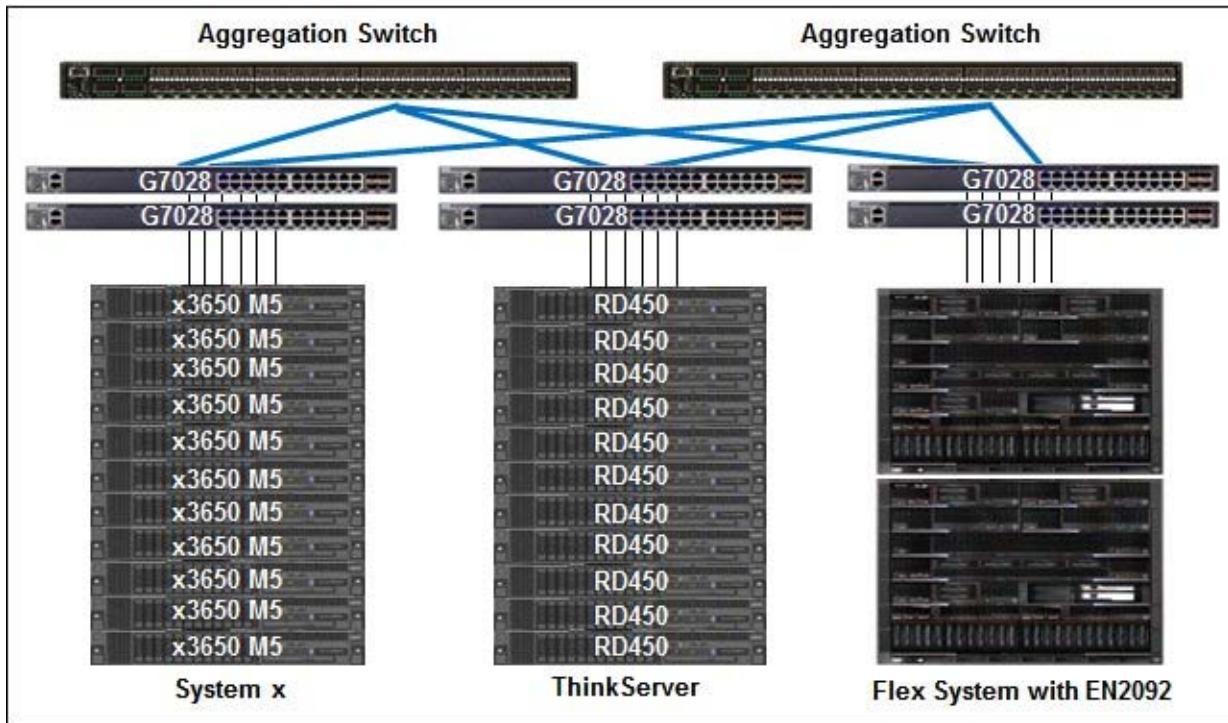

Figure 6. Rack-optimized server aggregation for 1GbE attached rack servers or a Flex System chassis

Server 1 GbE aggregation and connection to storage

Here are the features of the server 1 GbE aggregation and connection to storage:

- A good price/performance point for a data center environment with 1 Gigabit performance and investment protection for 10 GbE

- Good for connectivity to network attached storage (NAS):
  - LenovoEMC px4-300r
  - LenovoEMC px4-400r
  - LenovoEMC px12-400r
  - LenovoEMC px12-450r

- Ideal for connectivity to iSCSI:
  - Storwize V3700
  - Storwize V5000
  - Storwize V7000

Figure 7 shows NAS and iSCSI storage connectivity.
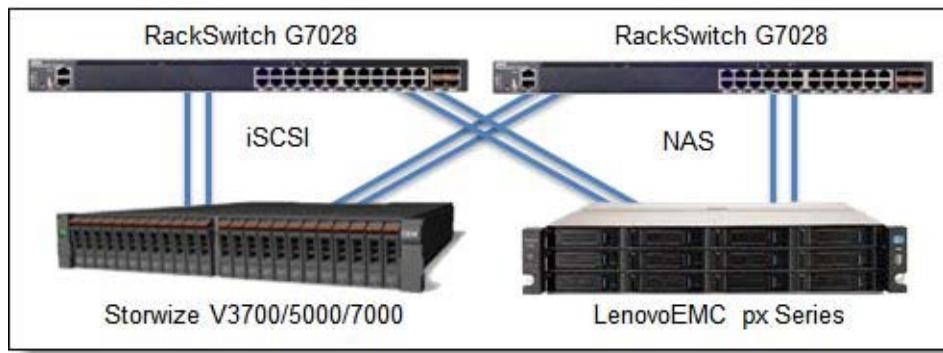
Figure 7. NAS and iSCSI storage connectivity

Related publications and links

For more information about the RackSwitch G7028, go to ibm.com/support/entry/portal/Documentation and see the following RackSwitch G7028 product resources:

- *RackSwitch G7028 Installation Guide*
- *RackSwitch G7028 isCLI Command Reference*
- *RackSwitch G7028 Application Guide*
- *RackSwitch G7028 Browser-Based Interface Quick Guide*

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